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Lewis Research Center



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Simple, Shock-Free, Quick-Release Connector: A Concept

A simple, shock-free, quick-release connector concept is based on the characteristics of friction between sliding surfaces. The connector (Figure 1) consists of two packs of foil strips. In each pack,

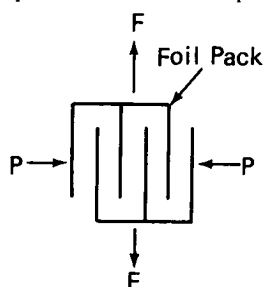


Figure 1. Connector Schematic

the strips are fastened together at one end. At the other end, the foil strips in the two packs are interleaved. If pressure is applied to squeeze the interleaved strips together, the friction force between the leaves is substantially increased, and the interleaved packs will withstand a tensile load. Relieving the pressure reduces the friction between the leaves and allows the two packs to be easily separated. By constructing each pack from a multiple number of foil strips, the friction force can be multiplied, and a high tensile load-carrying capability can be achieved with a relatively low compressive force. The equation for computing the tensile load-carrying capability is:

$$F = \mu N n$$

where: F = tensile load-carrying capability, i.e., total friction force (in lb)

μ = coefficient of friction

N = compressive force normal to foil leaves (in lb)

n = number of sliding surfaces in contact. i.e., number of leaves.

A conceptual configuration of the connector is shown in Figure 2. One pack of leaves is fastened to a support structure; the other is fastened to the supported load. Compressive force is applied to the

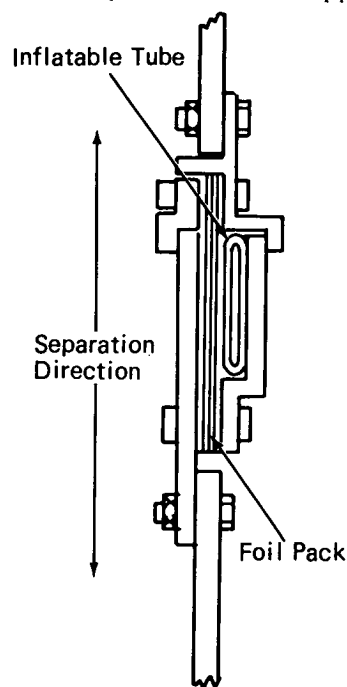


Figure 2. Conceptual Configuration

interleaved packs by an inflatable tube. Metal plates on either side back up the interleaved packs and the inflatable tube in order to contain the compressive force. In such a configuration, 50 leaves (25 in each pack) of aluminum foil (coefficient of friction 1.0) with 6.45 cm^2 (1 in.²) of compressed area could support a load of 227 kg (500 lbs) with 68.9 kN/m^2 (10 psi) pressure in the inflatable tube.

(continued overleaf)

The advantages of this connector are: (1) separation is smooth and shock-free; and (2) the connector can also act as a seal.

Notes:

1. This development is in the conceptual stage only and, as of the date of publication of this document, neither a model nor prototype has been constructed.
2. The coefficient of friction may be lower if there are any oil particles on the surface or if some sheets of foil start to slip ahead of others.

3. No additional documentation is available. Specific questions, however, may be directed to:

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Patent status:

No patent action is contemplated by NASA.

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